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From Representation to Simulation

The impacts of BIM on Architectural Design

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Synopsis

Building information modelling is an information delivery method that is made available for the use of architects and the other actors of the architecture, engineering and construction industry. In recent years, in many countries it became an obligatory project delivery mode for architects. As a result, prevailing use of this method alters the modes of notation and the logic of design in architectural offices. While architects used to employ representations of the design to communicate with other parties, with the BIM methods and software they are forced to create information models which can be regarded as simulations of a future building and are open to the control and revisions of other participants who are involved in building processes. Since it promotes a collaborative production and gathering whole information on a single model, it brings many opportunities such as increased reliability, foreseeing of costs and calculation of efficiency. However, by causing architects to change their accustomed ways of working, BIM also effects design approaches of architects and the nature of architecture. In this regard this paper aims to discover in which aspects BIM methods have impacts on architecture and alter the focus of architectural design especially in the designing processes at the architectural offices. The paper mainly depends on current literature and aims to analyse current conditions in relation with the old habits.

Key words: Architectural Design, Building Information Modelling, Architectural Notation, Representation, Simulation.

Building Information Modelling (BIM), which is defined as an architectural design model tied to a digital relational database, is regarded as the main tool that entails a profound change which can be conceived as a complete digitalization of all processes of the profession. As a relatively new and widespread mode of creating, delivering and managing the information that is associated with the various phases of a building life cycle such as design, construction and operation, it forces architects to change their modes of production. By doing so, it impacts on the nature of the profession.

One consequence of the widespread use of BIM methods in architecture is the ceasing role of drawing as a way of communication between architects and the other actors of design and construction. Although the digitalization in architecture industry has started long before BIM methods and software, transition of the design tools from manual drawing (pencil) to 2D/3D CAD were not regarded as a complete digitalization or a paradigm shift. BIM methods and technologies however, have the potential to change the logic of design. The main reason behind this is the arising of BIM technologies from a necessity to handle the complexity of the design and construction processes, as opposed to CAD software. CAD software and other ways of utilizing computers were architectural endeavours to explore the capabilities of the digital means to facilitate design. The outputs of these tools were mainly 2D or 3D geometric definitions. Charles Eastman claims that 2D CAD technologies were merely electronic equivalents of traditional paper documentation (Eastman et al. 2011). But, the object oriented, parametric and integrative mode of operation of the BIM helps to calculate and export any kind of necessary information for design improvement and real construction of the building. In ideal, BIM aims to achieve a digital twin of building to manage any phase of the design and construction processes. Through the means of BIM, instead of creating a variety of 2D reflections of the designed building, architects become able to create one or more accurate models, which also includes technical semantic information data in addition to geometric information, and can be represented in different forms of representation. This operation mode of BIM also answers a basic need in the architectural profession, which is to be able to make automated renovations across fragmented drawing sheets. While 2D and 3D CAD still are techniques to represent design, BIM simulates the building. Therefore, the use of BIM techniques corresponds a shift from drawing, which was the essential tool of the architect since Renaissance in Europe, to digital modelling. Drawing had paramount impact on formation of architecture as a profession. Likewise, information modelling replacing drawing will have its own affects.

In a digital environment where any information can be ascribed on the model, the simulated digital version of the building becomes testable in many aspects. Buildings are expected to perform against different tasks. By this way, performance becomes a prior criteria of design above many other aspects that a design is expected to satisfy. Crucially, the priorities and the focus of architectural design change. While programs, functions and tectonic were the key issues of architectural design, with the new techniques based on creating a digital self of a future building, the focus of design becomes performance, operation and a new understanding of tectonic.

Additionally, BIM methods as a digital information data storing-managing and

delivery method that promotes to integrate all information of a future building in a single environment, aims to increase consistency and reliability in construction. Due to the fact that the construction of a building involves various expertise, gathering all the necessary information for consistency requires collaborative work and different expert groups and stake holders to be included in the design process. Although collaborative production is a democratization utopia in design, since design is a unique, individual action in its modern definition, collectivity carries the risk of extermination the design itself by turning it into a common operation, as well. This also refers to the problematic of authorship, changing the position of the architect and changing the definition of architecture.

Inasmuch as BIM includes any information for construction and operation of an asset, besides design information, it causes a whole digitalization in design and manufacturing and alters the logic of these processes deeply. The digital revolution had organizational and social effects on the different industries of the world's economy. Architecture Engineering and Construction industry would be effected in a similar way to these industries which already underwent the transition. The role of the architect today was established in Renaissance as a man who does not participate the action of construction, but determines how the buildings should be built in a certain way. Before Renaissance the architects were master builders who knew how to build but never had the complete comprehension of a building. With the tool of drawing, architect had the remote but full control of the building. Although today this ascribed role of architects alters, for the reason that BIM promotes collaboration and integration of inter-disciplinary information, the architect of the era does not become a master building again like his pre-renaissance predecessors. The tool to create the information of design was a monopoly of architects during the modern times, however, with the power of digital simulation, many actors become able to participate in design from its very beginning. While the master builders of antiquity were exclusive makers and architect of modern era was a designer, due to the BIM providing an interactive digital platform for other actors to participate in digital construction of the future building, new architect becomes a participant or a role player like other agents, in a more complex organization of construction of a building. In conclusion, as summarized BIM would have various impacts on architecture. Within the scope of this work, it is aimed to inquiry these aspects and consequences of implications on profession.

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Biography

Funda Tan. PhD candidate at Istanbul Technical University, Architectural Design Program and a research assistant at Gebze Technical University, Faculty of Architecture. She received her master's degree from Istanbul Technical University, Architectural Design Program and her bachelor form Mimar Sinan University of Fine Arts, Department of Architecture. Previously, she has also worked at several architecture schools and she assisted and instructed architectural design studios and courses. She has spent 2016-2017 fall and spring terms at University of Lisbon, Faculty of Architecture as visiting researcher. Her main areas of interest consist architectural expressions, architectural notation, representation, simulation, impacts of architectural notation techniques on architecture. Currently, she has been working on her PhD thesis titled: "From representation to simulation; Impacts of BIM Methods on Architectural Practise".

Nurbin Paker. Associate Professor at Istanbul Technical University, Faculty of Architecture. She received her bachelor, master and Ph.D. degrees in ITU. She completed her PhD in 2001 with a thesis entitled "Interaction between Knowledge and Creativity in Architectural Design Education". She has been a visiting scholar at University of Newcastle upon Tyne, CARDO, UK in 1995-1996 and at University of Cincinnati, DAAP, USA between 1998-2000. She conducted undergraduate and graduate level architectural design studios. She also organized and participated in national and international workshops, exhibitions, conferences and research projects. Her research areas and interests are mostly focused on "architectural and environmental design", "design theory", "creativity in architectural design education". She has undertaken various architectural design projects, architectural design competition juries, received architectural design awards and has put some architectural applications into practice by herself and with some colleagues. She also has a National Architectural Award for Teknopark-Istanbul Headquarters Building in 2018.